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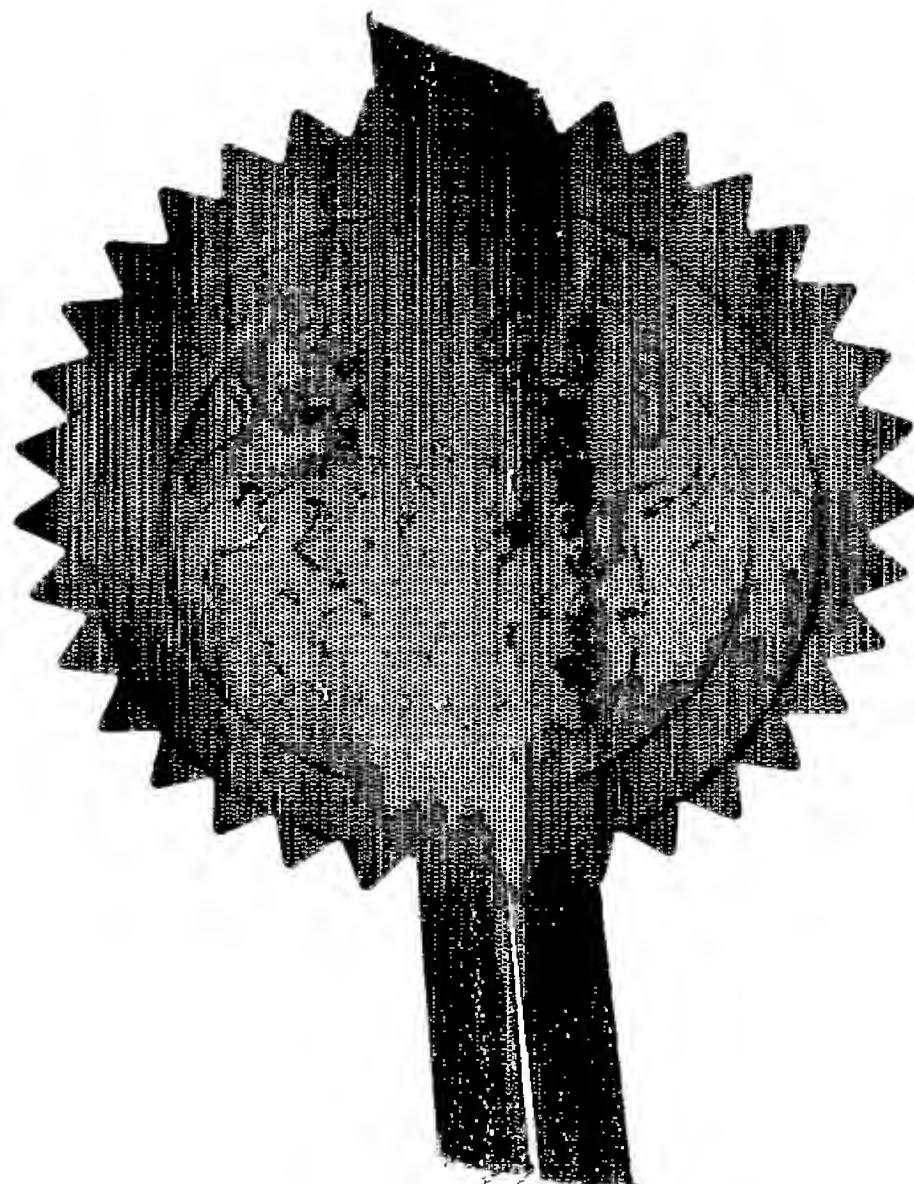
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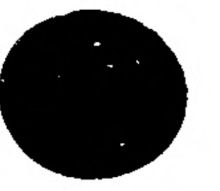
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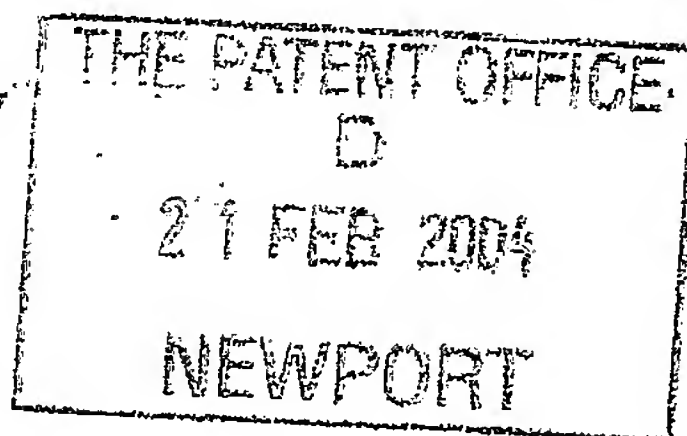
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P01/7700 0100-0403881.6 NONE

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21 FEB 2004

1. Your reference	0400050		
2. Patent application number (The Patent Office will fill in this part)	0403881.6		
3. Full name, address and postcode of the or of each applicant (underline all surnames)	SMITHS GROUP PLC 765 FINCHLEY ROAD LONDON NW11 8DS		
Patents ADP number (if you know it)	8032310001		
If the applicant is a corporate body, give the country/state of its incorporation	GB		
4. Title of the invention	VACUUM CLEANER APPARATUS		
5. Name of your agent (if you have one)	J. M. FLINT		
"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)	765 FINCHLEY ROAD LONDON NW11 8DS		
Patents ADP number (if you know it)	1063304001		
6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number	Country	Priority application number (if you know it)	Date of filing (day / month / year)
7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application	Number of earlier application		Date of filing (day / month / year)
8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if: a) any applicant named in part 3 is not an inventor, or b) there is an inventor who is not named as an applicant, or c) any named applicant is a corporate body. See note (d))	YES		

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Continuation sheets of this form

Description 6

Claim(s)

Abstract

Drawing(s) 2 & 2

10. If you are also filing any of the following, state how many against each item.

Priority documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (Patents Form 7/77)

Request for preliminary examination and search (Patents Form 9/77)

Request for substantive examination (Patents Form 10/77)

Any other documents (please specify)

11. I/We request the grant of a patent on the basis of this application.

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Date 20 FEB 2004

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## VACUUM CLEANER APPARATUS

This invention relates to vacuum cleaner apparatus.

Upright vacuum cleaners often have a hose that can be attached for cleaning stairs or other locations most conveniently cleaned by an accessory tool cleaning head attached to the free end of the hose. Preferably the hose is stowed on the vacuum cleaner itself to make storage easier and so that the hose is always accessible. There are, however, difficulties in stowing a hose on the cleaner because of the limited space available. One solution is to use a high ratio stretch hose, that is, a hose with a natural short length but which can be pulled against its resilience to a longer length. Such stretch hoses can have a ratio of extended/retracted length of up to 6:1. This enables a hose of useful length to be stored on a vacuum cleaner, such as in a vertical orientation. Stretch hoses, however, do have a problem because force needs to be applied to extend the hose and to keep it extended. The force applied to the hose tends to pull the vacuum cleaner machine towards the user and the tension in the hose tends to pull against any furniture around which the hose is lead.

WO 03/024294 describes a hose having a natural extended length that can be retracted to a shorter length for storage by occluding the free end of the hose and allowing the suction from the cleaner to pull the hose to a shorter length. Provision must then be made for retaining the hose in its shorter length after removal of the suction. Other hoses retracted in length by suction are described in DE 19738329, WO 99/35954, EP 1011408, EP 388676 and US 4050113.



It is an object of the present invention to provide an alternative vacuum cleaner.

According to one aspect of the present invention there is provided an upright vacuum cleaner of the kind having a base including floor-cleaning means, a housing mounted above the base for collecting material cleaned from the floor and handle means by which a user can manoeuvre the cleaner, the cleaner including a hose assembly having a first end attached with the cleaner towards the lower end of the cleaner and a second, free end, the hose assembly being of the kind having a natural extended length and that can be retracted to a shorter length by occluding passage of air through the hose towards its free end, a tubular wand slidable coaxially relative to the hose such that the hose and wand can be stowed on the cleaner, and means on the cleaner for receiving the stowed hose assembly in a generally vertical orientation.

The wand may be slidable inside the hose or outside the hose.

According to another aspect of the present invention there is provided a hose assembly for a vacuum cleaner of the above one aspect of the invention.

A vacuum cleaner including a hose assembly according to the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a side elevation view of the cleaner with the hose assembly stowed;

Figure 2 is a side elevation view of a lower part of the cleaner with the hose unstowed and extended for use; and

Figure 3 is a side elevation view of a modified form the cleaner.

With reference first to Figure 1 there is shown an upright vacuum cleaner having a base unit 1 at its lower end of the conventional kind, having floor cleaning means in the form of a suction inlet and beater brushes and bars or the like (not shown). The base unit has wheels, rollers or the like 2 by which the cleaner can be moved over a floor. A housing 3 mounted above the base unit 1 contains a suction pump or blower 4 and a dust collection and filtration unit 5, which may be of a conventional kind, such as including a filtering fabric bag or a cyclone tank. A handle 6 extends substantially vertically from the base unit 1 and is bent at its upper end to form a grip 7 by which the user can push, pull and manoeuvre the cleaner. As so far described, the cleaner is conventional.

The cleaner includes a hose assembly 10 for use in cleaning stairs, elevated surfaces, crevices, furniture and the like. The hose assembly comprises a length of a retractable hose 11 and a wand 12. The hose 11 may be similar to that described in WO 03/024294 in that it has a helical reinforcing spring wire 13 with a natural axially-extended condition and a sleeve 14 of a flexible plastics material attached to its outside. The axial resilience of the hose 11 is such that it can be retracted to a shorter length for stowage by suction power generated by the cleaner when the free end of the hose is occluded. Preferably the sleeve 14 is arranged to fold inwardly when retracted since, although this does reduce the bore through the hose 11 and hence reduces the suction force, it enables the hose to be retracted to a shorter length than



would be possible with an outwardly-folding sleeve. Alternatively, an outwardly-folding hose sleeve could be used. The hose 11 is fixed at one end with the base unit 1, that is, towards the lower end of the cleaner. The means by which the hose 11 is fixed with the base unit 1 preferably allows it to be removed when necessary. The other end of the hose 11 is terminated by a flange 15.

The wand 12 takes the form of rigid tube 16, such as of a plastics material, having an external diameter slightly less than the internal diameter of the hose 11, so that the wand can be slid into and out of the hose. One end 17 of the wand 12 is located within the hose 11 and has an enlarged flange 18 to prevent it being pulled out of the hose past the hose flange 15. The other, free end 19 of the wand 12 has a manually-operable valve 20, which is normally open but which the user can close to occlude the passage through the wand and thereby prevent air flow along the hose assembly 10. The free end 20 of the wand 12 is shaped to enable a cleaning head (not shown) to be coupled with it in any conventional manner, such as by a conventional taper fit. As shown in Figure 1, when stowed, the free end 19 of the wand 12 projects from the upper end of the hose 11 and is engaged by a fitting 21 on the handle 6. The wand 12 projects coaxially within the hose 11 and its inner end 17 locates at or close to the lower end of the hose. It can be seen, therefore, that the length of the wand 12 is substantially the same as the retracted length of the hose 11. The inner end 17 of the wand 12 could engage a fitting on the base unit 1 or at the lower end of the hose 11 but this is not essential since the hose can be adequately restrained in its stowed position even if there is a short length of hose below the lower end of the wand.

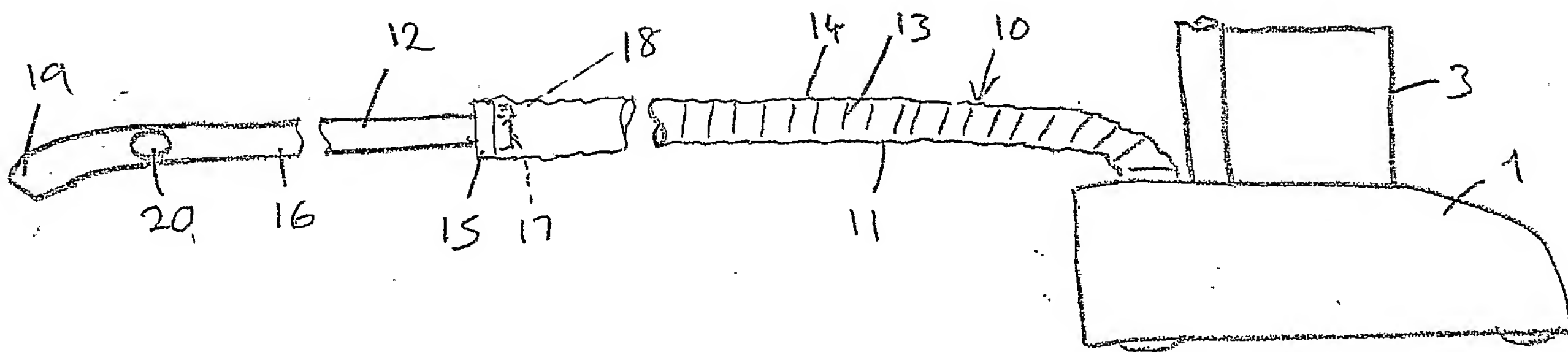
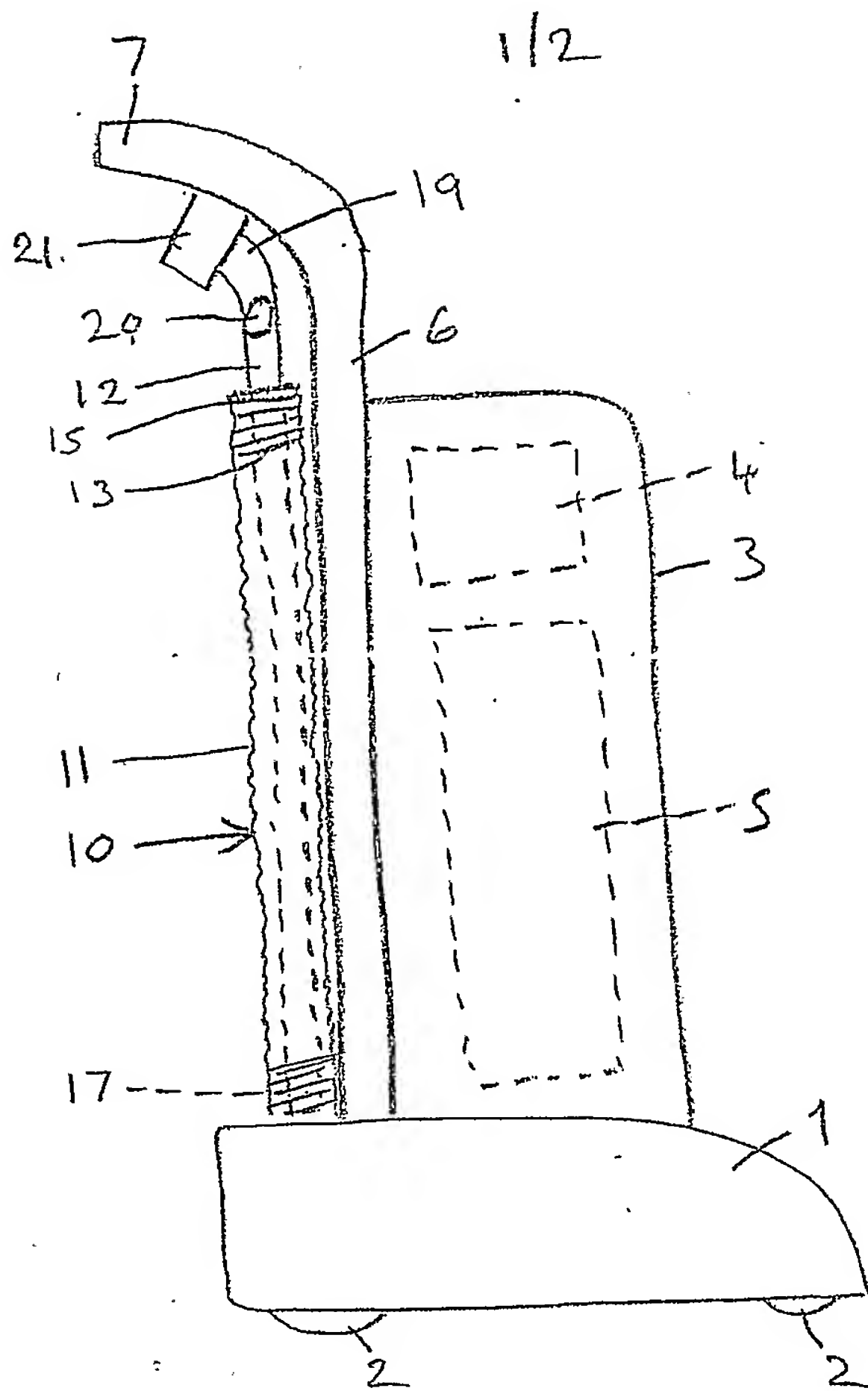
To use the hose assembly 10, the upper end 19 of the wand 12 is pulled free of the fitting 21 and the wand is pulled telescopically out of the hose 11 to its maximum extent, so that the flange 18 on the wand engages and seals with the flange 15 on the hose, as shown in Figure 2. Once the wand 12 is released, the hose 11 is unconstrained so it expands to its natural, extended length. Typically, the retracted length of the hose 11 might be about 600mm and its extended length might be 3600mm. With the additional length of the wand 12 this can give a maximum reach for the assembly 10 of 4200mm. The hose assembly 10 is attached with the cleaner towards its lower end and is unconstrained above this so that it is free to flex at the lower end. This allows for a maximum usable length of the hose assembly 10 and prevents any force applied by the hose 11 pulling over the cleaner. The user uses the hose assembly 10 in the normal way for cleaning. The natural extended length of the hose 11 means that there is no need for the user continually to pull it to keep it extended. This makes the hose assembly 10 easier to use and allows it to be lead around furniture and the like without pulling on the furniture. There is also less risk that the user will inadvertently move the vacuum cleaner because the hose will not pull the cleaner as much as stretch hoses do.

When the user has finished using the hose assembly 10, he simply closes the valve 20 with the cleaner still on and allows the suction to reduce pressure within the hose 11 sufficiently to retract it towards the cleaner. The user then slides the wand 12 back into the hose 11 and clips it into the fitting 21. The vacuum cleaner can then be turned off.

The wand need not locate coaxially within the hose, as described in the arrangement of Figures 1 and 2, but could locate outside the hose, as shown in Figure 3 where parts similar to those in Figures 1 and 2 have been given the same reference numbers with the addition of a

prime '. In this arrangement the hose 11' is the same as previously described except that the flange 15' at its free end extends outwardly. The wand 12' has a larger diameter, its internal diameter being slightly larger than the external diameter of the hose 11'. At its rear, lower end 17', the wand 12' has an inwardly-extending flange 18' arranged to engage and seal with the flange 15' at the free end of the hose 11'. The hose assembly 10' is used and retracted in the same way as described above.

It will be appreciated that there are various other ways in which the hose assembly can be retained on the cleaner. It is not essential for the hose assembly to be stowed and retained along the handle but it could, for example, be fitted within a vertical silo at the side of the cleaner.





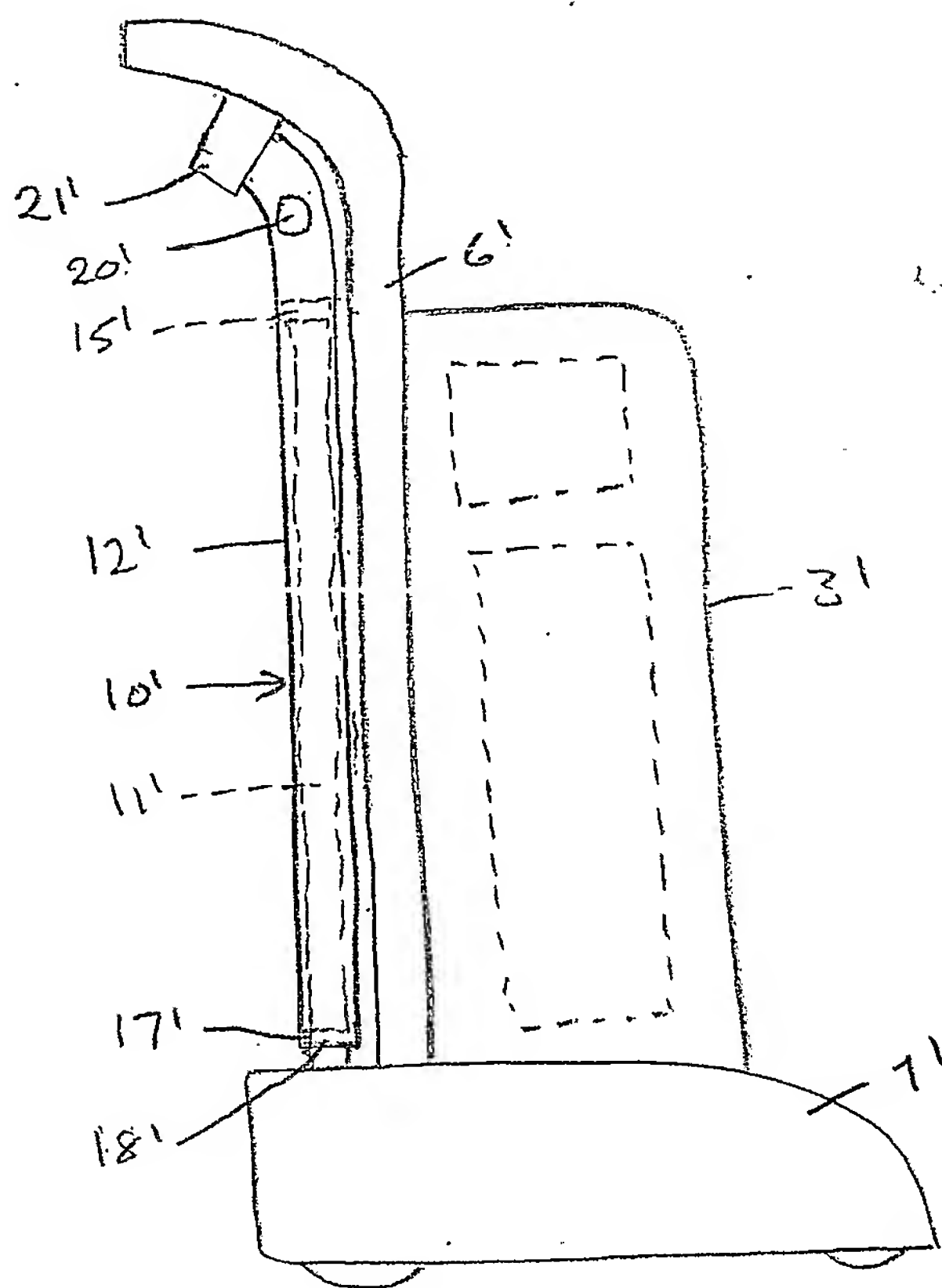


FIG. 3



